SwissMAP Annual General Meeting

September 10 – September 13, 2023
Les Diablerets

Juhan ARU (EPFL)

Title: When CFT meets random geometry

Abstract: *Recently, probabilists have (yet again) turned their eyes towards Conformal field theory (CFT). In this talk I would like to discuss what they are finding out and how they apply the new insights and results. In particular, I aim to explain how the recent progress in understanding CFTs from a probabilistic perspective has provided both new formulas and new perspectives for random geometric objects like Schramm-Loewner evolutions (SLE) and Conformal loop ensembles (CLE), used to describe interfaces in critical 2d statistical mechanics models.*

Ata Deniz AYDIN (ETHZ)

Title: The quantization problem for measures on Riemannian manifolds

Abstract: *The quantization problem seeks to find measures supported on finitely many points that best approximate a given measure with respect to the Wasserstein distance. I will discuss known results about the asymptotics of this problem on Euclidean space and Riemannian manifolds, and generalize these results by introducing a new notion of the metric growth of a manifold, called covering growth, which we can control under various assumptions such as lower bounds on Ricci curvature. This is based on joint work with M. Iacobelli.*

Rahel BAUMGARTNER (UNIGE)

Title: Trotterized quantum simulation of disorder Hamiltonians in a single-mode optical cavity

Abstract:

Simon BECKER (ETHZ)

Title: Ten Martinis in the continuum

Abstract: *We study the effect of placing a periodic material in a constant magnetic field and discuss the spectral structure of the underlying Hamiltonian and learn what this has to do with alcoholic beverages.*

Pietro BENETTI GENOLINI (UNIGE)

Title: Equivariant localization for AdS/CFT

Abstract: *Equivariant localization can be applied to gravity in presence of symmetry to compute various observables without solving the equations of motion. This is particularly effective for supersymmetric solutions, which are guaranteed to have an Abelian symmetry and set of equivariantly closed form representing BPS observables. I will review recent results showing how to express observables in supergravity supersymmetric solutions using only topological information and the fixed point formula, without having to solve the equations of motion.*

Gianmichele BLASI (UNIGE)

Title: Topological Josephson junctions in the integer quantum Hall regime

Abstract:

Giovanni CANEPA (UNIGE)

Title: The reduced phase space of gravity and the standard model.

Abstract: *In this talk I will outline a description of the reduced phase space of gravity, for a space or time-like boundary, with gauge and matter fields. The reduced phase space is the space of possible initial conditions and will be presented as the reduction of a symplectic space with respect to a coisotropic submanifold using the Kijowski and Tulczijew construction. Furthermore I will explain how to describe the reduced phase space cohomologically using the BFV formalism. This talk is based on arXiv:2006.13078, arXiv:2206.14680 and arXiv:2307.14955.*

Antoine GAGNEBIN (ETHZ)

Title: Final data problem for Vlasov-type equations

Abstract: *In this talk, I will discuss Vlasov-type equations on the torus T^d, which are partial differential equations (PDEs) used to model confined plasma physics, particularly in scenarios where collisions between particles and external magnetic effects are neglected. The focus will be on a class of equilibria for these equations and the effects of perturbations around these equilibria. While the long-term behavior of solutions given initial data (the Cauchy problem) is well understood through the phenomenon known as Landau damping, I will present a new result concerning the final data problem. Specifically, instead of starting with an initial condition for the PDE, we consider the problem where a final state is given.*

Ilia GAIUR (UNIGE)

Title: Products of Bessel functions and Periods

Abstract: *In my talk I consider the generating function for the reciprocals N-th power of factorials. Using explicit constructions, I show a connection of product formulas for such series with the periods for certain families of algebraic hypersurfaces. Then I will discuss geometry of such hypersurfaces and connection with Buchstaber-Rees polynomials, which define N -valued group laws. Joint work with V. Rubtsov and D. van Straten*

Shota KOMATSU (CERN)

Title: New approaches to confinement

Abstract: *Understanding strong-coupling dynamics of gauge theory in four dimensions is one of the most important challenges in modern physics with diverse theoretical and phenomenological implications. In particular, essential mechanisms of how the Yang-Mills theory exhibits color confinement and mass gap through the formation of chromo-electric fluxtubes and how the dynamics of the fluxtubes controls physical observables, such as the meson and glueball spectrum, still remain elusive. I will discuss a few new ideas addressing these questions based on recent developments. The first is to focus on two-dimensional avatars (known as the 't Hooft model) and obtain precise results using a connection to integrability and a theory of Fredholm equations. The second is to consider Yang-Mills theory on a special curved background called anti de-Sitter space.*

Manuel LOPARCO (EPFL)

Title: Non-perturbative aspects of QFT in de Sitter spacetime

Abstract: *The geometry of our universe is well approximated by a de Sitter spacetime both today and during inflation. Studying Quantum Field Theory in de Sitter space is thus of great phenomenological relevance. At the same time, QFT in dS is full of subtleties and qualitative differences from the more classic settings of Minkowski and Anti de Sitter space. I will present recent progress in understanding the realization of concepts such as unitarity and the renormalization group flow in QFT in dS. Then, I will present some unpublished results showing that photon states appear in free massive theories in this spacetime and I will speculate on the possible interesting physical implications of this fact.*

Edward MAZENC (ETHZ)

Title: The Simplest Gauge/String Duality

Thérèse MOERSCHELL (ETHZ)

Title: Non-uniqueness for the advection-diffusion equation

Abstract: *Uniqueness of parabolic solutions to the advection diffusion equation (ADE) is guaranteed for divergence free velocity fields that are square-integrable in time and space. We will see that this condition is sharp by constructing direct examples of non-uniqueness when either time- or space-integrability is lowered, using a stochastic-Lagrangian approach.*

Alexandre REGE (ETHZ)

Title: Quasineutral limit of Vlasov-Poisson to Yudovich solutions of Incompressible Euler

Abstract: *We derive the two dimensional incompressible Euler equation as a quasineutral limit of the Vlasov-Poisson equation using a modulated energy approach. We propose a strategy which enables to treat solutions where the gradient of the velocity is merely BMO, in accordance to the celebrated Yudovich theorem.*

Veronica SACCHI (EPFL)

Title: A study of scalar QED in de Sitter spacetime

Abstract: *Interacting theories in de Sitter spacetime are notoriously technically hard to study, and despite the continuous effort motivated by the huge theoretical and phenomenological interest, rather few theories have been completely solved on this background. In this talk, we will review a proposal on how to use the techniques developed for Anti de Sitter spacetimes and we will apply them to perturbatively solve dS scalar QED at loop level. We will highlight the difference of this theory with those on AdS or flat space, and we will end with a glimpse at what this example may teach us about perturbative gravity in dS.*

Antoine VUIGNIER (EPFL)

Title: Gravity from matrix quantum mechanics

Abstract: *I will discuss holography in the context of matrix quantum mechanics. This provides a nice toolbox to explore the gauge-gravity duality since this is just quantum mechanics. In particular I will consider the Berenstein-Maldacena-Nastase (BMN) model in the strong coupling regime. In this limit I will argue that the spectrum of the quantum mechanical Hamiltonian matches the spectrum of gravitons around the so called pp-wave spacetime.*

Klaus WIDMAYER (UZH)

Title: On the mathematics of Landau's damping

Abstract: *While "Landau damping" is regarded as an important effect in the dynamics of hot, collisionless plasmas, its mathematical understanding is still in its infancy. In particular, the terminology has evolved to include several types of (stabilizing) effects in diverse physical contexts, the mathematical description of which can differ markedly between various settings*

of relevance. The aim of this talk is to provide some overview of the context and background of these questions in the setting of the Vlasov-Poisson system of classical plasma physics.